

U.S. Serial No. 10/762,979

Reply to Office Action of July 28, 2005

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Original) An apparatus for treating a breathing disorder comprising:
a gas supplying means; and
a leak resistant patient interface operably connected using a tube to the gas supplying means, the leak resistant patient interface having an exit, wherein the apparatus is arranged such that during periods of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube towards the gas supplying means and away from the exit; wherein the apparatus is adapted such that during an initial exhale portion of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube towards the gas supplying means and away from the exit and wash flow out of the tube such that during a next inhale portion a sufficient amount of rebreathing occurs to control the breathing disorder.
2. (Previously presented) The apparatus of claim 1, wherein the leak resistant patient interface comprises an oral interface and nasal occlusion device.
3. (Original) The apparatus of claim 2, wherein the apparatus is adapted such that during normal breathing periods little rebreathing occurs.
4. (Original) The apparatus of claim 3, wherein the apparatus is adapted such that during normal breathing periods some retrograde flow occurs but wash flow is sufficient to remove exhaled air before a next inhale portion.
5. (Original) The apparatus of claim 4, wherein the retrograde flow into the tube is influenced by gas pressure from the gas supplying means and by an exit hole size.
6. (Original) An apparatus for treating a breathing disorder comprising:
a gas supplying means; and
a leak resistant patient interface operably connected using a tube to the gas supplying means,

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the leak resistant patient interface having an exit, wherein the apparatus is arranged such that during periods of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube towards the gas supplying means and away from the exit, wherein gas pressure from the gas supplying means is set at a controlled level below four cm H₂O pressure independently of the respiratory cycle of the patient.

7. (Previously presented) The apparatus of claim 6, wherein the leak resistant patient interface comprises an oral interface and nasal occlusion device.
8. (Previously presented) The apparatus of claim 7, wherein a size of the exit size is adjustable.
9. (Original) The apparatus of claim 8, wherein pressure in the leak resistant patient interface is set high enough to treat obstructive sleep apnea.
10. (Original) The apparatus of Claim 9, wherein the gas-supplying means comprises a blower which blows air to the leak resistant patient interface.
11. (Previously presented) The apparatus of Claim 6, wherein the leak resistant patient interface is adapted to fit about a patient's nose.
12. (Previously presented) The apparatus of Claim 6, wherein the gas-supplying means is adjustable.
13. (Original) A method of treating a patient suffering from a breathing disorder, the method comprising:
providing an apparatus comprising a gas supplying means and a leak resistant patient interface adapted to be fit on the patient's airway, the leak resistant patient interface operably connected using a tube to the gas supplying means, the leak resistant patient interface having an exit;
fitting the leak resistant patient interface to the patient; and
adjusting the apparatus such that during periods of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube, wherein the adjusting step is done such that during an initial exhale portion of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube and wash

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flow out of the tube such that during a next inhale portion some rebreathing occurs sufficient to treat the breathing disorder.

14. (Previously presented) The method of claim 13, wherein the leak resistant patient interface comprises a dental appliance and a nasal occlusion device, and fitting the leak resistant patient interface to the patient comprises:

fitting the dental appliance to the mouth of the patient; and
blocking the patient's nose with the nasal occlusion device.

15. (Original) The method of claim 14, wherein the adjusting step is done such that during normal breathing periods little rebreathing occurs.

16. (Original) The method of claim 15, wherein the adjusting step is done such that during normal breathing periods some retrograde flow occurs but wash flow is sufficient to remove exhaled air before a next inhale portion.

17. (Original) The method of claim 14, wherein the retrograde flow into the tube is influenced by gas pressure from the gas supplying means and by an exit hole size.

18. (Original) A method of treating a patient suffering from a breathing disorder, the method comprising:

providing an apparatus comprising a gas supplying means and a leak resistant patient interface adapted to be fit on the patient's airway, the leak resistant patient interface operably connected using a tube to the gas supplying means, the leak resistant patient interface having an exit;

fitting the leak resistant patient interface to the patient; and
adjusting the apparatus such that during periods of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube wherein the adjusting step is such that gas pressure from the gas supplying means is set at a level below four cm H₂O pressure independently of the respiratory cycle of the patient.

19. (Previously presented) The method of claim 18, wherein the leak resistant patient interface comprises a dental appliance and a nasal occlusion device, and fitting the leak resistant patient interface to the patient comprises:

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fitting the dental appliance to the mouth of the patient; and
blocking the patient's nose with the nasal occlusion device.

20. (Canceled)
21. (Original) The method of claim 19, wherein the adjusting step includes adjusting an exit hole size.
22. (Original) The method of claim 19, wherein pressure in the leak resistant patient interface is set high enough to treat obstructive sleep apnea.
23. (Previously presented) The method of Claim 19, wherein the gas supplying means comprises a blower.
24. (Original) An apparatus for treating a breathing disorder comprising:
a gas supplying means;
a leak resistant patient interface adapted to be fit on a patient's airway, the leak resistant patient interface operably connected using an input tube to the gas supplying means, the leak resistant patient interface having an exit;
a variable air resistance means operably connected to the exit of the leak resistant patient interface; and
a controller operably connected to the variable air resistance means to adjust a level of rebreathing that occurs and maintain a temporally variable flow of air in the input tube without producing significant deviations in leak resistant patient interface pressure.
25. (Previously presented) The apparatus of claim 24, wherein the leak resistant patient interface comprises an oral interface and nasal occlusion device.
26. (Previously presented) The apparatus of Claim 25, wherein the variable air resistance means comprises an adjustable valve.
27. (Previously presented) The apparatus of Claim 26, further comprising an exit tube between the leak resistant patient interface and the adjustable valve.

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28. (Previously presented) The apparatus of Claim 25, wherein the controller adjusts the variable air resistance means to provide a dead space during certain portions of a sleep cycle.

29. (Previously presented) The apparatus of Claim 25, wherein the controller adjusts the variable air resistance means to modify exit flow out of the leak resistant patient interface at different times during a night's sleep.

30. (Previously presented) The apparatus of Claim 25, further comprising a flow meter adapted to provide signals to the controller.

31. (Previously presented) The apparatus of Claim 25, wherein the controller detects periodicities in sleep cycle to determine how to adjust the level of rebreathing.

32 - 35. (Canceled)

36. (Currently amended) An apparatus for treating a breathing disorder comprising:
a blower;
a leak resistant patient interface adapted to be fit on a patient's airway, the leak resistant patient interface incorporating a dental appliance to reduce mouth leaks and a nasal occlusion device to eliminate nose leaks, the leak resistant patient interface operably connected using a tube to the gas supplying means the blower; and
a processor adapted to adjust a level of rebreathing to control the breathing disorder in the patient by adjusting an active control element of the apparatus.

37. (Original) The apparatus of Claim 36, wherein the active control element is a variable air resistance means operably connected to a exit of the leak resistant patient interface.

38. (Original) The apparatus of Claim 36, wherein the active control element is a unit to adjust a blower output.

39. (Original) The apparatus of Claim 38, wherein the active control element is a unit to adjust a blower output revolutions per minute.

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40. (Original) The apparatus of Claim 38, further comprising an exit tube connected to the leak resistant patient interface.
41. (Original) The apparatus of Claim 36, wherein the active control element is a recirculator.
42. (Original) The apparatus of Claim 36, wherein the active control element is a valve to a dead space volume.
43. (Original) The apparatus of Claim 36, wherein the active control element is adjusted during a periodic sleep cycle of the patient.
44. (Original) The apparatus of Claim 36, wherein the active control element is adjusted over an entire sleeping period.
45. (Previously presented) The apparatus of Claim 36, wherein the processor receives data from a flow meter or a carbon dioxide sensor.
46. (Canceled)
47. (Previously presented) An apparatus for treating a breathing disorder comprising:
a blower; and
a leak resistant patient interface adapted to be fit on a patient's airway, the leak resistant patient interface operably connected using a tube to the blower, the leak resistant patient interface having an exit, the resistance of the exit being set such that during treatment of the breathing disorder in the patient, expiratory air from the patient flows through the tube towards the blower and away from the exit, wherein the apparatus is arranged such that a gas flow from the blower is less than that used to treat obstructive sleep apnea.
48. (Previously presented) The apparatus of claim 47, wherein the leak resistant patient interface comprises an oral interface and nasal occlusion device.
49. (Original) The apparatus of claim 48, wherein gas pressure from blower is set at four cm H₂O

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pressure or below.

50. (Canceled)

51. (Original) The apparatus of claim 48, wherein the apparatus is arranged such that during periods of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube.

52. (Original) The apparatus of claim 51, wherein the apparatus is adapted such that during an initial exhale portion of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube and wash flow out of the tube such that during a next inhale portion some rebreathing occurs.

53. (Original) The apparatus of claim 51, wherein the apparatus is adapted such that during normal breathing periods little rebreathing occurs.

54. (Original) The apparatus of claim 51, wherein the apparatus is adapted such that during normal breathing periods some retrograde flow occurs but wash flow is sufficient to remove exhaled air before a next inhale portion.

55. (Original) The apparatus of Claim 48 wherein the blower is adjustable.

56. (Original) A method of treating a patient suffering from a breathing disorder, the method comprising:

providing an apparatus comprising a blower and a leak resistant patient interface adapted to be fit on the patient's airway, the leak resistant patient interface operably connected using a tube to the blower, the leak resistant patient interface having an exit;

fitting the leak resistant patient interface to the patient's airway; and

adjusting the apparatus such that gas flow from the blower is controlled at a variable flow rate and essentially constant pressure, the pressure being less than that used to treat obstructive sleep apnea, in order to treat the breathing disorder in the patient.

57. (Previously presented) The method of claim 56, wherein the leak resistant patient interface

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comprises a dental appliance and a nasal occlusion device, and fitting the leak resistant patient interface to the patient comprises:

fitting the dental appliance to the mouth of the patient; and
blocking the patient's nose with the nasal occlusion device.

58. (Original) The method of claim 57, wherein the adjusting step is such that gas pressure from the blower is set below four cm H₂O pressure.

59. (Canceled)

60. (Previously presented) The method of claim 57, wherein the adjusting step is such that during periods of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube.

61. (Original) The method of claim 60, wherein the adjusting step is done such that during an initial exhale portion of increased breathing associated with the breathing disorder, some of the patient's exhaled gasses flow retrograde into the tube and wash flow out of the tube such that during a next inhale portion some rebreathing occurs.

62. (Original) The method of claim 60, wherein the adjusting step is done such that during normal breathing periods little rebreathing occurs.

63. (Original) The method of claim 62, wherein the adjusting step is done such that during normal breathing periods some retrograde flow occurs but wash flow is sufficient to remove the exhaled air before a next inhale portion.

64. (Currently amended) The method of claim 57 60, wherein the retrograde flow into the tube is influenced by gas pressure from the blower and by a size of the exit.

65-76. (Canceled)

77. (Original) A method comprising:

providing an apparatus comprising a blower and a leak resistant patient interface adapted to be

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fit on a patient's airway, the leak resistant patient interface operably connected using a tube to the blower, the leak resistant patient interface having an exit, the resistance of the exit being set that during treatment of a breathing disorder in the patient, expiratory air from the patient flows through the tube towards the blower and away from the exit;

fitting the leak resistant patient interface to the patient's airway;

treating an obstructive sleep apnea with the apparatus;

adjusting the apparatus to treat the breathing disorder; and

treating obstructive sleep apnea with the apparatus

78. (Original) The method of claim 77 in which the leak resistant patient interface comprises a dental appliance and a nasal occlusion device, and fitting the leak resistant patient interface to the patient comprises:

fitting the dental appliance to the mouth of the patient; and

blocking the patient's nose with the nasal occlusion device

79. (Original) The method of claim 78, wherein the adjusting step comprises adjusting the apparatus such that gas flow from the blower is less than that used to treat obstructive sleep apnea to treat the breathing disorder in the patient.

80. (Original) The method of claim 78, wherein the adjusting step is such that gas pressure from the blower is set below four cm H₂O pressure.

81. (Canceled)

82. (Original) The method of claim 78 wherein the adjusting step is such that during periods of increased breathing associated with the breathing disorder, some of the patient's exhaled gasses flow retrograde into the tube.

83. (Original) The method of claim 82, wherein the adjusting step is done such that during an initial exhale portion of increased breathing associated with the breathing disorder, some exhaled gasses from the patient flow retrograde into the tube and wash flow out of the tube such that during a next inhale portion some rebreathing occurs.

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84. (Original) The method of claim 82, wherein the adjusting step is done such that during normal breathing periods little rebreathing occurs.

85. (Original) The method of claim 84, wherein the adjusting step is done such that during normal breathing periods some retrograde flow occurs but wash flow is sufficient to remove exhaled air before a next inhale portion.

86. (Original) The method of claim 78, wherein the retrograde flow into the tube is influenced by gas pressure from the blower and by a size of the exit hole.

87. (Original) The method of claim 78, wherein the obstructive sleep apnea treating step comprises supplying blower pressure greater than eight cm H₂O.

88. (Original) The method of claim 78, wherein the obstructive sleep apnea treating step occurs before the adjusting step.

89. (Original) The apparatus of claim 1, wherein gas pressure from the gas supplying means is set below four cm H₂O pressure.

90. (Cancelled)

91. (Original) The method of claim 13, wherein the adjusting step is such that gas pressure from the gas supplying means is set below four cm H₂O pressure.

92. (Cancelled)

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